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Onaga

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(54) **METHOD OF CONTROLLING PRINTER INFORMATION IN A NETWORK ENVIRONMENT**

(75) Inventor: **Tyson Onaga**, Cypress, CA (US)

(73) Assignee: **Toshiba America Information Systems Inc.**, Irvine, CA (US)

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(52) **U.S. Cl.** **709/219**; 709/250; 395/101; 395/500.42

(58) **Field of Search** 709/203, 219, 709/250; 395/101, 500.42

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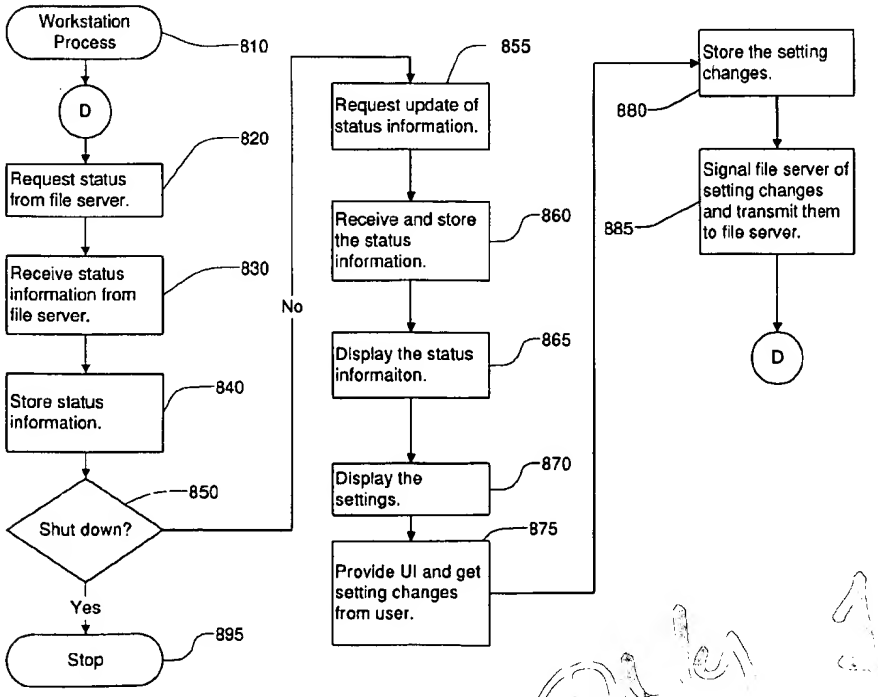
Primary Examiner—Krisna Lim
(74) *Attorney, Agent, or Firm*—Arter & Hadden LLP

(57) **ABSTRACT**

A data processing system for printing print jobs originating from workstations on a computer network, for copying copy jobs and for scanning scan jobs to the workstations using an intelligent peripheral device. Status information about the intelligent peripheral device, and setting changes for the intelligent peripheral device, are communicated from network workstations to the intelligent peripheral device via a file server. The processing load of the intelligent peripheral device is thereby reduced. The file server also provides a gate keeper function, limiting the status information and setting changes available to users according to their class: end user, workgroup administrator, network administrator or technician.

14 Claims, 9 Drawing Sheets



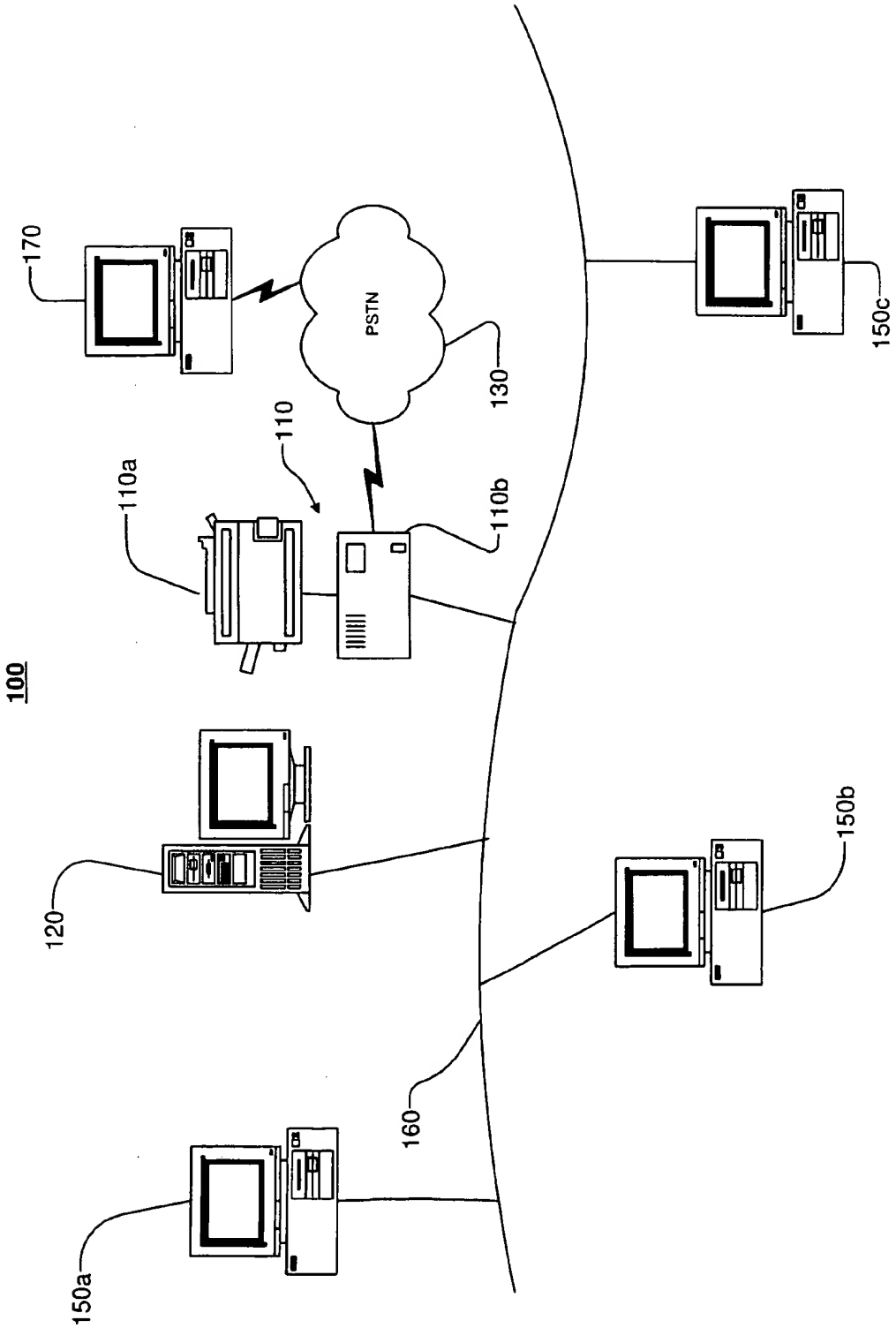


Figure 1

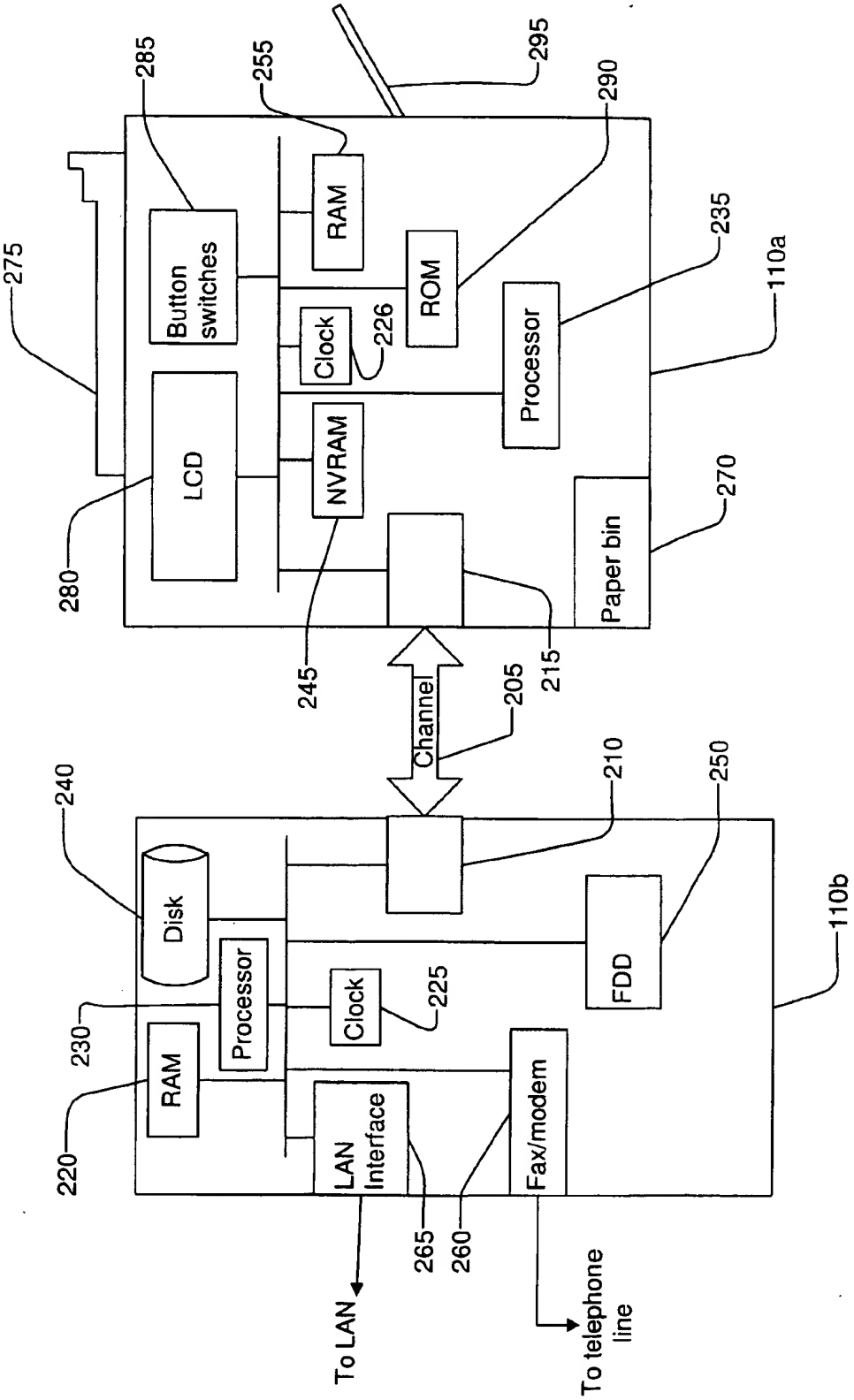

285
255
295
290
275
Button switches
RAM
ROM
235
110a
Clock
226
Processor
LCD
NVRAM
270
280
Paper bin
245
215
Channel
205
210
250
240
Disk
Processor
FDD
110b
Clock
225
230
RAM
LAN Interface
Fax/modem
220
265
260
To LAN
To telephone line

Figure 2

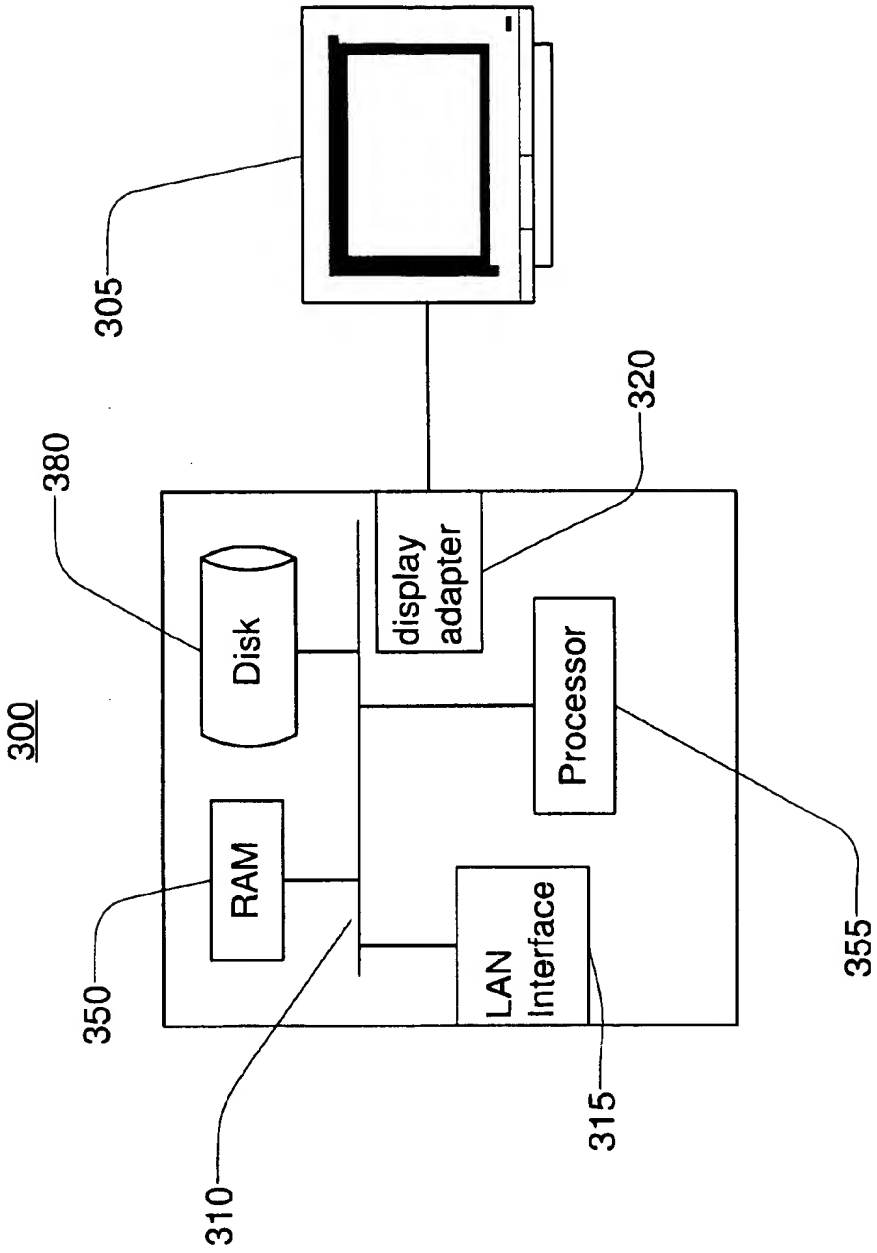

305
320
380
display adapter
Disk
Processor
300
RAM
LAN Interface
350
355
315
310

Figure 3

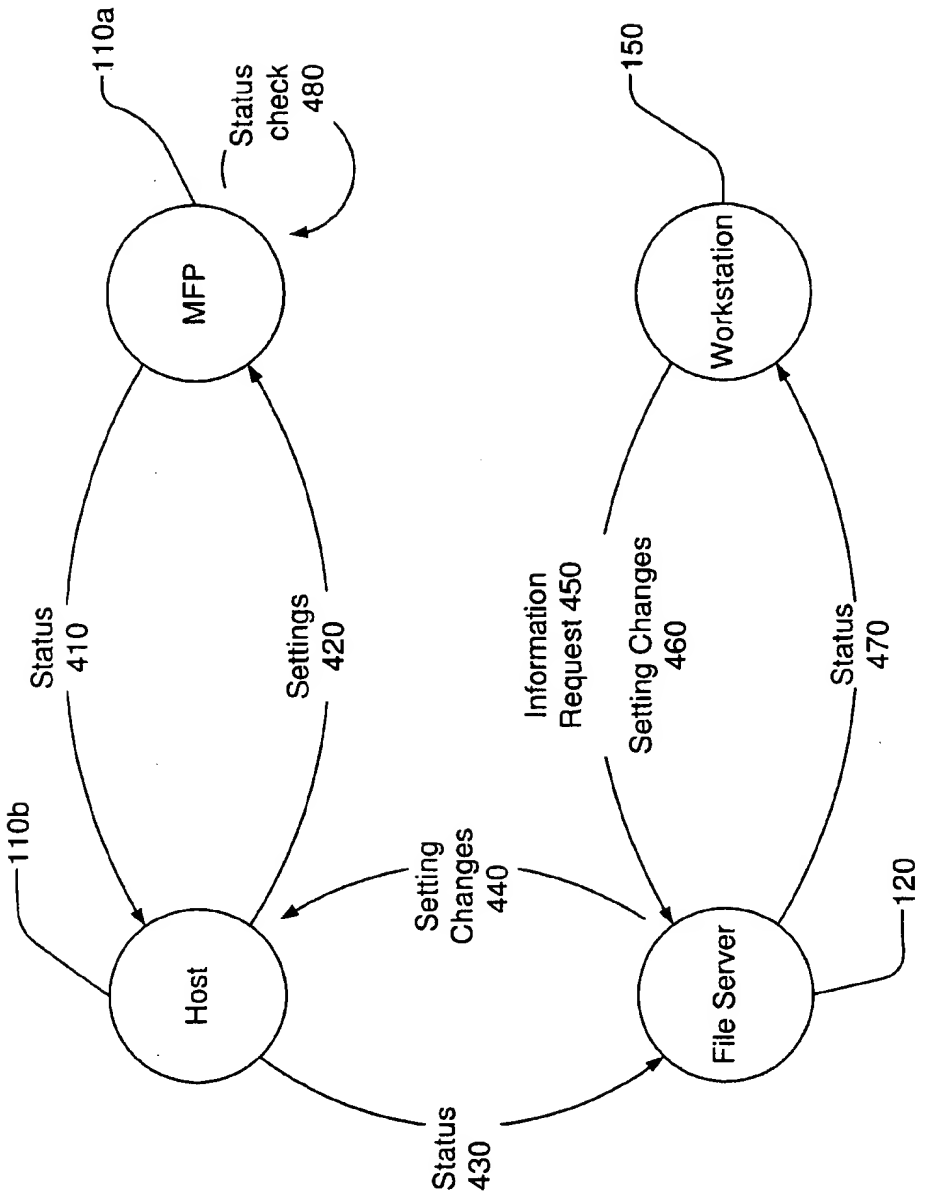

110a
Status check 480
MFP
150
Workstation
Status 410
Settings 420
Information Request 450
Setting Changes 460
Status 470
110b
Host
Setting Changes 440
File Server
120
Status 430

Figure 4

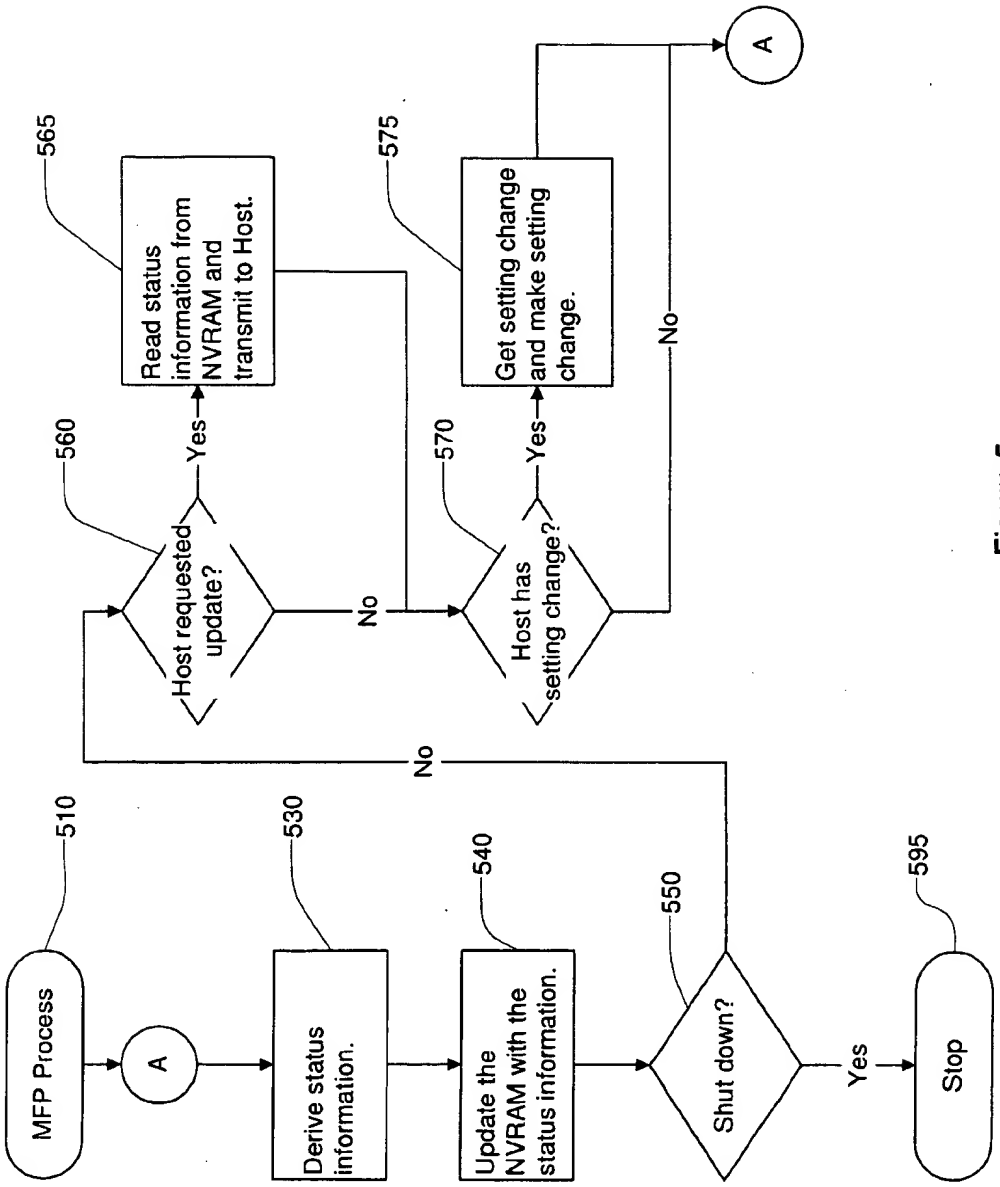

MFP Process
510
A
Derive status information.
530
Update the NVRAM with the status information.
540
Shut down?
550
Yes
Stop
595
No
Host requested update?
560
Yes
Read status information from NVRAM and transmit to Host.
565
No
Host has setting change?
570
Yes
Get setting change and make setting change.
575
No
A

Figure 5

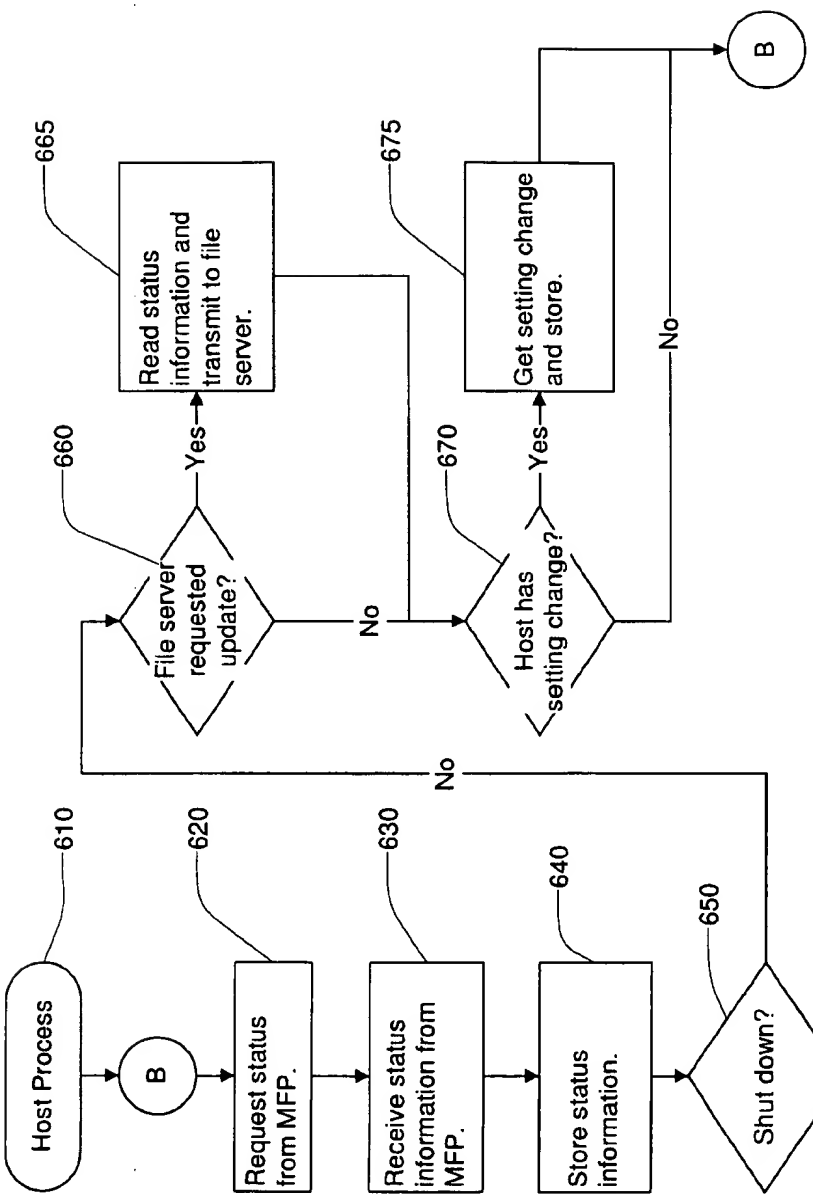

Host Process
610
B
Request status from MFP.
620
Receive status information from MFP.
630
Store status information.
640
Shut down?
650
Yes
Stop
695
No
File server requested update?
660
Yes
Read status information and transmit to file server.
665
No
Host has setting change?
670
Yes
Get setting change and store.
675
No
B

Figure 6

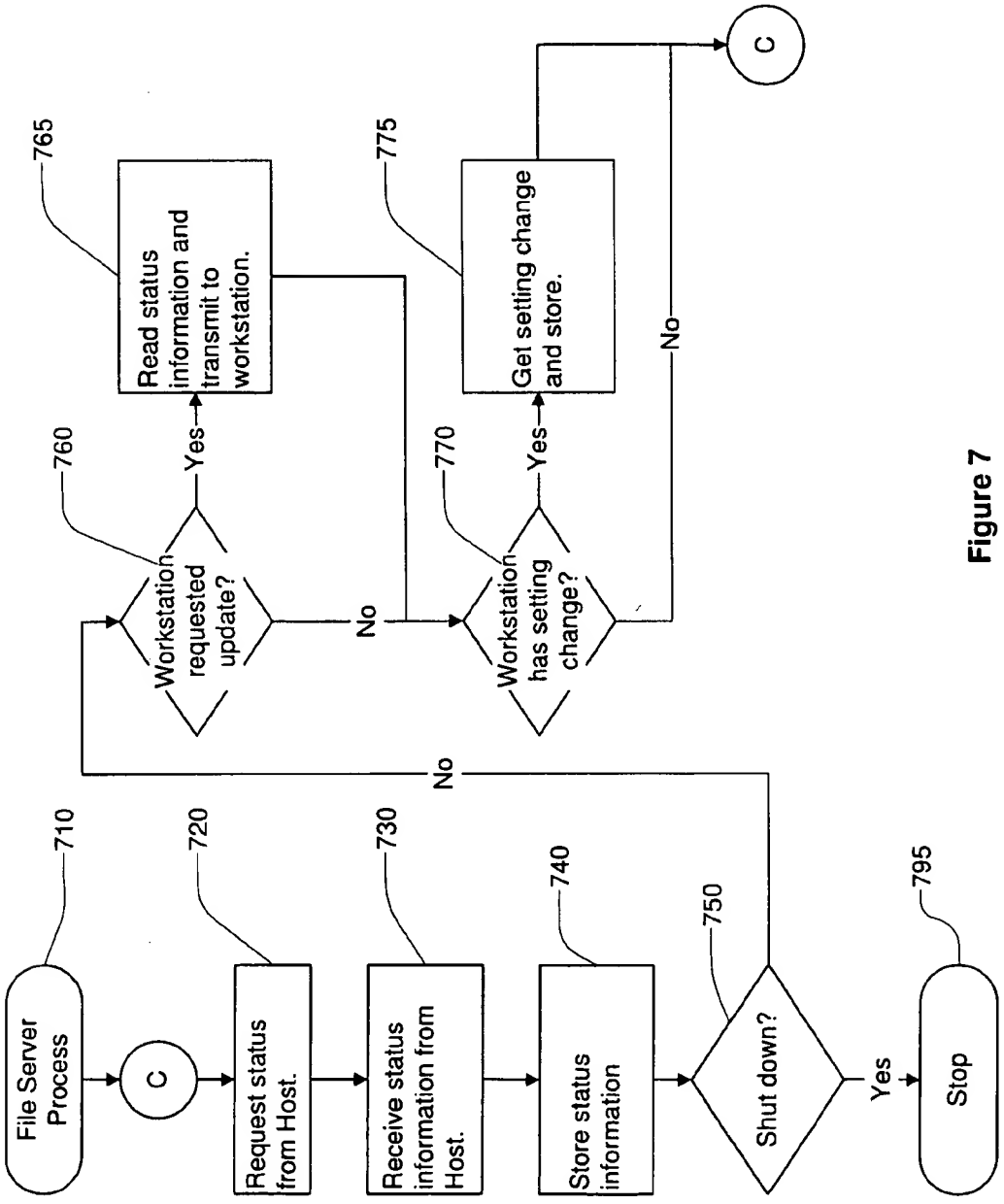

710
File Server Process
C
720
Request status from Host.
730
Receive status information from Host.
740
Store status information
750
Shut down?
Yes
795
Stop
No
760
Workstation requested update?
Yes
765
Read status information and transmit to workstation.
No
770
Workstation has setting change?
Yes
775
Get setting change and store.
No
C

Figure 7

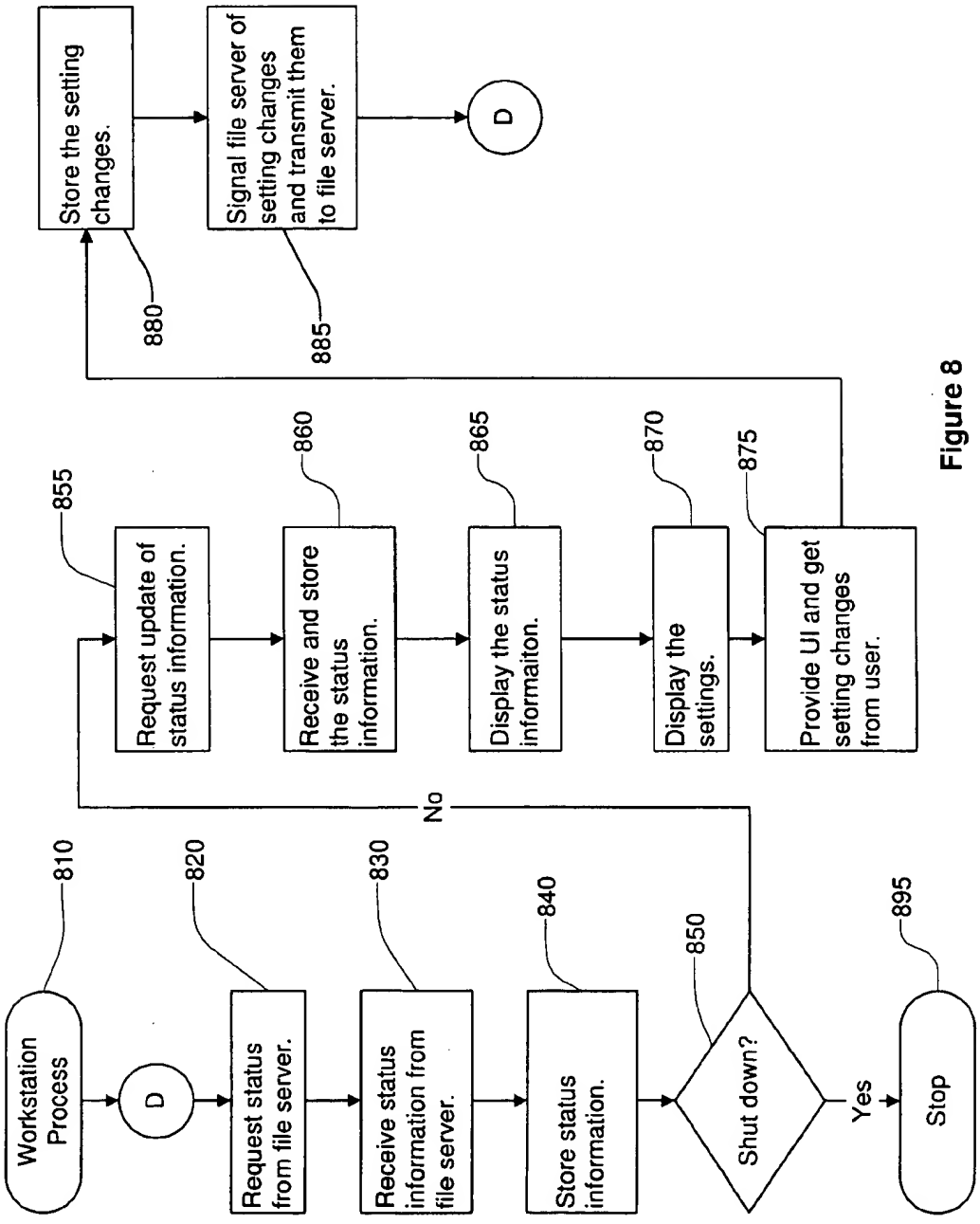

Workstation Process
810
D
820
Request status from file server.
Receive status information from file server.
830
Store status information.
840
Shut down?
850
Yes
Stop
895
No
Request update of status information.
855
Receive and store the status information.
860
Display the status informaiton.
865
Display the settings.
870
Provide UI and get setting changes from user.
875
Store the setting changes.
880
Signal file server of setting changes and transmit them to file server.
885
D

Figure 8

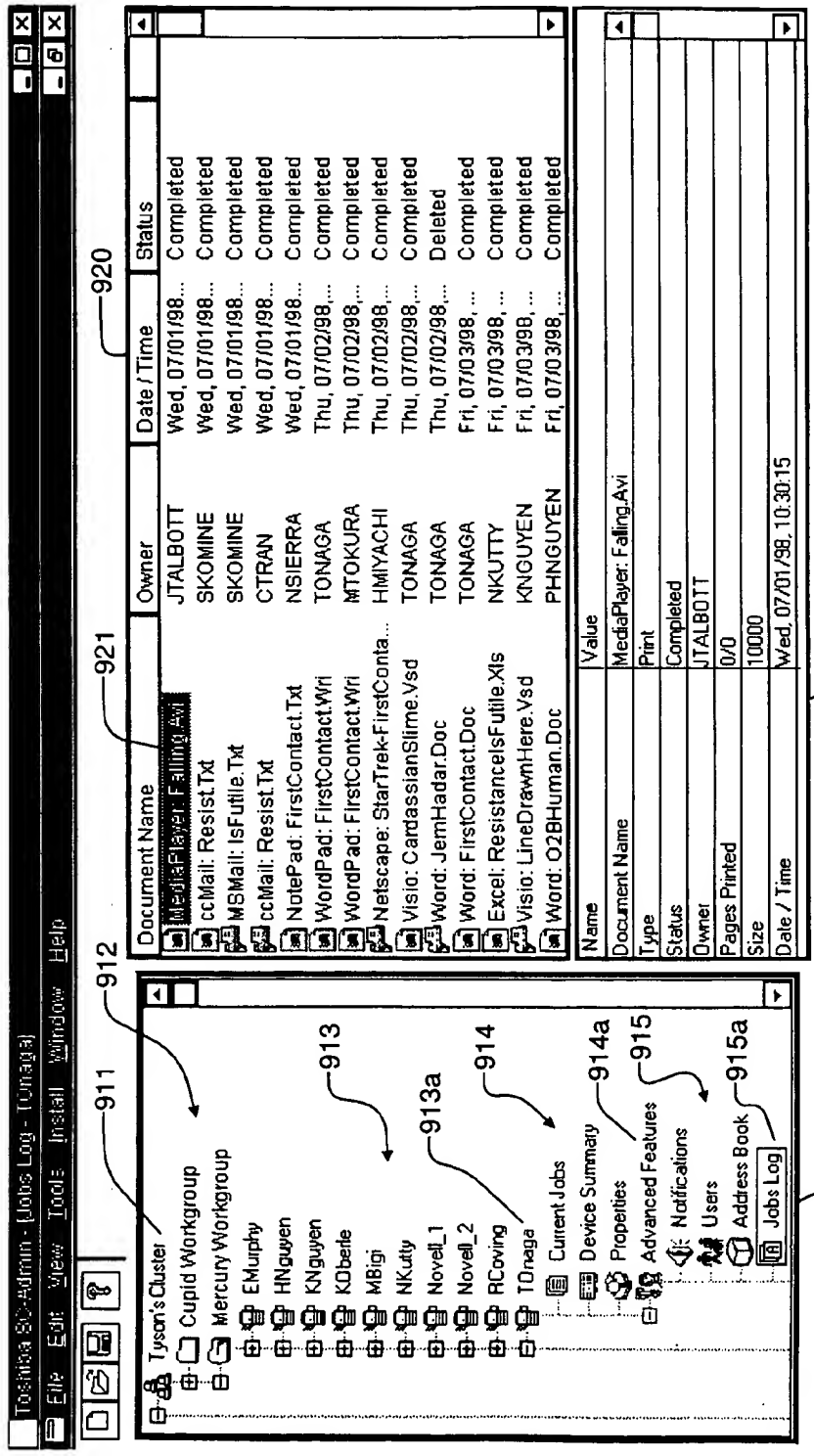

900
911
912
913
913a
914
914a
915
915a
910
920
921
930
Toshiba SQL Admin - [Jobs Log - TOnaga]
File Edit View Tools Install Window Help
Tyson's Cluster
Cupid Workgroup
Mercury Workgroup
EMurphy
HNguyen
KNguyen
KOberle
MBigi
NKutty
Novell_1
Novell_2
RCoving
TOnaga
Current Jobs
Device Summary
Properties
Advanced Features
Notifications
Users
Address Book
Jobs Log
Document Name
Owner
Date / Time
Status
MediaPlayer: Falling.Avi JTALBOTT Wed, 07/01/98... Completed
ccMail: Resist.Txt SKOMINE Wed, 07/01/98... Completed
MSMail: IsFutile.Txt SKOMINE Wed, 07/01/98... Completed
ccMail: Resist.Txt CTRAN Wed, 07/01/98... Completed
NotePad: FirstContact.Txt NSIERRA Wed, 07/01/98... Completed
WordPad: FirstContact.Wri TONAGA Thu, 07/02/98,... Completed
WordPad: FirstContact.Wri MTOKURA Thu, 07/02/98,... Completed
Netscape: StarTrek-FirstConta... HMIYACHI Thu, 07/02/98,... Completed
Visio: CardassianSlime.Vsd TONAGA Thu, 07/02/98,... Completed
Word: JemHadar.Doc TONAGA Thu, 07/02/98,... Deleted
Word: FirstContact.Doc TONAGA Fri, 07/03/98, ... Completed
Excel: ResistanceIsFutile.Xls NKUTTY Fri, 07/03/98, ... Completed
Visio: LineDrawnHere.Vsd KNGUYEN Fri, 07/03/98, ... Completed
Word: O2BHuman.Doc PHNGUYEN Fri, 07/03/98, ... Completed
Name
Value
Document Name MediaPlayer: Falling.Avi
Type Print
Status Completed
Owner JTALBOTT
Pages Printed 0/0
Size 10000
Date / Time Wed, 07/01/98, 10:30:15

Figure 9

METHOD OF CONTROLLING PRINTER INFORMATION IN A NETWORK ENVIRONMENT

RELATED APPLICATIONS

This application is related to Application No. 08/800,859, filed on Feb. 24, 1997, now U.S. Pat. No. 6,108,492, issued on Aug. 22, 2000, entitled "Remote System Monitoring" and Application No. 08/799,527, filed on Feb. 12, 1997, now U.S. Pat. No. 5,862,404, entitled "Method of Administering Work Group Printers" which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to methods of controlling and maintaining electronic equipment, and more particularly to devices such as multifunction peripherals which have advanced processing, status monitoring and configuration capabilities.

2. Description of Related Art

In a typical networked multi-user computer environment, a number of individual workstations are linked together through a network, usually a local area network (LAN). Also linked on the LAN are one or more peripheral devices such as printers, facsimile machines, scanners or plotters. One or more file servers are also linked to the network and serve to manage allocation of the devices to workstations which request the use of the devices. The allocation procedures typically involve accepting requests, determining the address of the device requested, maintaining queues, establishing priorities and relaying data from the workstation to the device.

Typically when a workstation user wishes to determine the status of a device that is networked on a LAN, the method available depends upon the intelligence of the device. The earlier generation of peripherals were "unintelligent," or perhaps, better "uncommunicative." They accepted data from the LAN and processed it according to instructions, but were incapable of relaying conditions back to the LAN. A workstation user, concerned about the status of a device to which he or she had sent a job, would have to leave the workstation to physically examine the device.

A server, such as a file server or a print server, might be able to provide some information regarding the status of a print job. However, this conditions related to the status of the print job in a print queue, and the print queue was neither created, maintained nor serviced by the printer. If a print job was removed from the print queue, one could infer that the printer was handling the print job. However, the status of the print job as it was handled by the printer could not be ascertained. For example, absence of a print job from the print queue could mean that the print job was complete, or it could also mean that the printer had received the print job into its buffer and was still processing the print job. Other features of such a print queue manager were reprioritization of print jobs and deletion of print jobs.

More recently, peripheral devices such as printers have become available which are able to determine and relay information concerning their status through a communications port, such as a network interface card (NIC) or a printer (LPT) port. Thus, information concerning the printer such as its device information (the manufacturer, command set and model of printer), the identity of the job it was currently processing, the status of its paper bins, ink supply, etc. which might be displayed on the printer's display panel, might be also relayed to a computer linked to the peripheral devices through a communications link. An example of this is the Lexmark Optra printer which provides identification data as well as other information as to status. However, querying the device and performing status checks slows the performance of the printer. Furthermore, these systems either provide too much or too little control over the printer.

More recently, peripheral devices have become available which are able to perform a number of related functions. These devices are known as multifunction peripherals (MFPs).

The Telecommunication Industry Association (TIA) has provided an MFP interface standard known as the IS-650 Multifunction Peripheral Industry Interface Standard, Level 1 (MFPI-1) specification version 5.5. According to this standard, an MFP is:

> Computer equipment used to scan, print, facsimile transmit, and/or copy documents. It also may have the capability to provide data modem and other voice telephony services. The MFP may be an integrated unit or may be several discrete units that are interconnected on the same communication channel to the Host or interconnected using several different channels. One or more of the subsystems may be omitted from the MFP.

A "Host" as defined in MFPI- 1 is any terminal or computer capable of providing commands and data to operate a peripheral, and in practice is a computer of any size, or a group of network nodes on a given local area network. As used herein, a "host" is a generic Host, providing the quality of functionality specified in MFPI- 1 without necessarily adhering to the specification. A "subsystem" according to MFPI- 1 is one of several logical peripheral units, such as printer, scanner, fax-data-voice (FDV) modem, internal memory, stand-alone controller (SAC), operator console and others which may exist in the MFP or Host. The Host and the MFP communicate through a "channel."

An MFP can operate in stand-alone mode, wherein two or more subsystems are used without interaction with the Host. One example of this is copying. Stand-alone operations may occur at the same time that the Host is accessing a different subsystem for a Host-controlled operation.

In a networked system where many workstations are sharing peripherals, the use of a multifunction peripheral is a mixed blessing. On the one hand, rather than providing, for example, two different scanner functions (one for reading documents for facsimile transmission, one for reading documents for copying) and three different printing functions (one for printing computer generated documents, one for printing documents received through facsimile transmission, and one for printing documents that have been scanned in for copying), a single scanning function and a single printing function perform the work of printer, copier and facsimile machine. On the other hand, the single multifunction peripheral is used at least as often as all of the individual devices would have been used alone. Previously, where there was one user wishing to print a document, one user wishing to transmit a document via facsimile, and one user wishing to copy a document, each would ordinarily each have directed

his or her task to a separate machine, and thus not interfere with one another. If any one of these devices was inoperable, the others could perform unimpeded. With a single machine performing all three functions (in our example), maintenance and prompt repairs are more important to ensuring the productivity enhancing capabilities and cost savings of the MFPs.

It is important in the operation of complex electronic equipment, such as MFPs, to maintain the efficiency and productivity of the machine. Machine downtime due to various conditions such as break-downs, malfunctions and errors due to normal wear and tear severely impact machine productivity. In addition, locations with multiple machine operations are often without an immediately available repair and maintenance technician. The machine may be in a geographically remote location, or a responsible technician may be working on another machine. It is important for efficiency to reduce machine down time and to improve the efficiency of technician time spent in monitoring and correcting the machine operation at a specific location.

Given a complex peripheral such as a high volume printer or multifunction peripheral which is attached to a network, a problem arises in controlling the device. One complication is that there are multiple types of users who access the peripheral. In general, users of a peripheral and technicians who need to check the condition of and maintain a peripheral access the peripheral in different ways. Typically, the user has a workstation which can send jobs to the peripheral and receive information regarding the status of the jobs, as error notices regarding things such as paper jams and empty paper trays. Typically, the technician has special equipment which are attached through special ports on the peripheral which permit the technician to obtain the peripheral's settings, diagnose low-level performance problems, and adjust various configurable settings. It can be seen that users and technicians are differentiated simply based upon their physical mode of access to the peripheral.

There generally has been now way, however, to differentiate the level of control and type of status information obtainable by various types of users of a peripheral. Although contemporary network operating systems may restrict access rights of a user or class of users to a peripheral, they do not permit varying levels of access.

SUMMARY OF THE INVENTION

In accordance with the invention, four classes of users have been identified: network administrators, workgroup administrators, end users and technicians. Each of these classes is given access to different classes of peripheral settings and features. A network administrator is allowed to control settings relating to how the peripheral interoperates with the network, and the status of jobs being processed by the peripheral. A workgroup administrator is allowed to control settings relating to how a corresponding workgroup uses the peripheral, including workgroup address books, letterhead features, watermarks, etc. End users have fairly limited access, primarily only the right to use the peripheral and to determine the status of their own jobs submitted to the peripheral. Technicians have access to the peripheral through the same type of workstation user interface provided to other users, and are allowed to access factory-level settings of the peripheral, such as counters for periodic maintenance, temperature settings, automatic processing settings, etc. In many cases, the access rights on one class are exclusive. Thus, technicians may access the factory-level settings, but have no need to access workgroup information or network configuration information.

In addition to the preset assignment of rights, the network administrator is also given the limited right to add, remove and delete access of workgroup administrators and end users to certain settings and functions.

Still further objects and advantages attaching to the device and to its use and operation will be apparent to those skilled in the art from the following particular description.

DESCRIPTION OF THE DRAWINGS

These and other advantages of the present invention are best understood with reference to the drawings, in which, in varying detail:

FIG. **1** is a block diagram of a computer network in accordance with the invention.

FIG. **2** is a block diagram of a data processing system including a Host and an MFP in accordance with the invention.

FIG. **3** is a block diagram of a general purpose computer.

FIG. **4** is a conceptual block diagram of data flows in the data processing system of FIG. **2**.

FIG. **5** is a flow chart of an MFP process in accordance with the invention.

FIG. **6** is a flow chart of a host process in accordance with the invention.

FIG. **7** is a flow chart of a file server process in accordance with the invention.

FIG. **8** is a flow chart of a workstation process in accordance with the invention.

FIG. **9** is a screen shot of a status information and setting control program for an administrator in accordance with the invention.

These and additional embodiments of the invention may now be better understood by turning to the following detailed description wherein an illustrated embodiment is described.

DETAILED DESCRIPTION OF THE INVENTION

Throughout this description, the preferred embodiment and examples shown should be considered as exemplars, rather than limitations on the apparatus and methods of the present invention.

FIG. **1** shows a local area network (LAN) **100**. Before proceeding to describe the LAN **100**, a few terms are defined. By "file server," it is meant a computer which controls access to file and disk resources on a network, and provides security and synchronization on the network through a network operating system. By "server," it is meant hardware, software or combinations of hardware and software which provides network services. By "workstation," it is meant a client computer which routes commands either to its local operating system or to a network interface adapter for processing and transmission on the network. A workstation may function as a server by including appropriate software, and may be for example, a print server, archive server or communication server. By "software" it is meant one or more computer interpretable programs and modules related and preferably integrated for performing a desired function. A "multifunction peripheral" is a peripheral which provides the functions of more than one peripheral, and typically provides printing and at least one of: copying, scanning and faxing.

By "intelligent peripheral device," it is meant a special purpose I/O processing device which is capable of relaying

information concerning its current status via a communications line. The "status information" of an intelligent peripheral device is transient, process-dependent information and may be, for example, the intelligent peripheral device's unique network address, which job is currently being handled, how much of the job is completed, paper supply status, and ink or toner supply levels. Settings are static and relate to how operations are to be performed. Status information may concern the MFP or the Host. Settings of both the MFP and the Host are stored.

To network communication lines **160** are coupled a number of workstations **150***a*, **150***b*, **150***c*, a file server **120** and an intelligent peripheral device **110**. The file server **120** and workstations **150** are preferably those well known in the art, such as computers having Intel Corporation (Santa Clara, Calif.) microprocessors and running Microsoft Corporation (Redmond, Wash.) Windows operating systems. The network communications lines **160** may be wire, fiber, or wireless channels as known in the art. Although only one file server is shown, the network **100** may include multiple file servers with different network operating systems and providing multiple access domains. The network **100** may also include hubs, routers and other devices (not shown).

The intelligent peripheral device **110** preferably comprises an MFP **110***a* coupled to a Host **110***b*. The Host **110***b* is coupled to the network communication lines **160**. Preferably, the Host **110***b* is a general purpose computer, having neither monitor, keyboard nor mouse, and running the Microsoft Windows NT operating system. The Host **110***b* functions as a server to provide appropriate peripheral services to the workstations **150** and the file server **120** on the network **100**.

FIG. **1** also shows a remote monitoring computer **170** coupled to the Host **110***b* by a public switched telephone network **130**. The remote monitoring computer **170** and public switched telephone network **130** are not part of the LAN **100**. The remote monitoring computer **170** is preferably generally as known in the art having an Intel microprocessor and running Microsoft Windows, but also having special programs for interaction with the Host **110***b* as set forth below. Preferably, the remote monitoring computer **170** has the same user interface as the workstations **150**.

Referring now to FIG. **2**, there is shown a block diagram of the Host **110***b* and the MFP **110***a*. The MFP **110***a* preferably comprises a high output digital copier having a communications interface **215** (preferably SCSI) and a hardware and software interface which allows the MFP **110***a* to receive rasterized print jobs from the Host **110***b*, manage the print jobs as well as its own copyjobs, and print the print jobs. The hardware includes a non-volatile data storage device **290** (preferably ROM or EPROM) and processor **235** in which programs are stored and run, respectively, for controlling the functions of the MFP **110***a*. The MFP **110***a* preferably also includes a short term rewritable data storage device **255** such as a RAM. The MFP **110***a* also includes a non-volatile rewritable data storage device **245** such as an NVRAM for storage of various information, include information regarding the status of operation of the MFP **110***a*. The MFP **110***a* includes standard components including automatic document feeder **275**, paper bin **270** and paper output tray **295**.

The MFP **110***a* includes a non-fixed display **280**, preferably an LCD, and user input device **285**, such as button switches. The MFP **110***a* has user interface software stored in the data storage device **290** which is responsible for displaying information on the display **280** and interpreting user inputs from the user input device **285**.

The Host **110***b* preferably comprises a server such as a computer having an Intel processor **230** and running Microsoft Windows NT. To maximize performance, there is preferably a one-to-one correspondence between Hosts and MFPs. In conjunction with the processor **230**, the Host **110***b* has a clock **225**, a short term rewritable data storage device **220** (preferably RAM) and a non-volatile rewritable data storage device **240** (preferably a hard disk) as known in the art. The Host **110***b* further includes a communications interface **210** through which the Host **110***b* communicates with the MFP **110***a* through a channel **205**. Preferably, the communications interface **210** is configured as a SCSI host. The Host **110***b* further preferably includes a fax/modem **260** for sending and receiving faxes via telephone lines **130** and for communicating with the remote monitoring computer **170**. The Host **110***b* includes management software stored in the long term data storage device **240** for managing print jobs, fax jobs and scan jobs. The Host **110***b* rasterizes print jobs from the LAN **100** into print data (a form native to the MFP **110***a*) and transmits the print data to the MFP **110***a* via the communications channel **205**. The Host preferably also has a removable storage device **250** such as a floppy drive which uses a removable storage medium such as a floppy disk (not shown).

The Host's fax/modem **260** is used for communicating conditions to the remote monitoring computer **170**. The fax/modem **260** is also used for sending fax jobs from the workstations **150** or originating from the MFP **110***a*, as well as receiving faxes which are generally printed by the MFP **110***a*. Thus, the processor **230** also tests the status of the fax/modem **260** before use and preferably queues outbound traffic. Preferably, notification has a higher priority than outbound faxes.

The MFP's processor **235**, under programmed control, is responsible for monitoring the status of the MFP and updating a status information table stored in the non-volatile rewritable data storage device **245**. The MFP's processor **235** operates in accordance with a clock **226** in the MFP **110***a*. Table 1 below sets forth a list of the MFP status information which is preferably included in the status information table.

TABLE 1

Status Information	Value Range	Initial Value	Privileges
Date/Time setting	12 chars		R/W
Auto Power off	0–15	0	R/W
Auto Power saving	0–20	9	R/W
Version	0–2	0	
Time mode(Auto clear)	0–10	3	R/W
Service personnel telephone number	10 digits		
PM counter setting value	0–999,999	0	
PM counter current value	0–999,999	0	
ADU/main unit cassette installation status	0–2	0	
PFP installation status	0	0	
MAX9	0	0	R/W
Print priority order for interrupt copy and fax memory full	0	0	
Electronic total counter	0–999,999	0	
A3/LD double count	0	0	
C7 counter	0–3	0	
Drum life counter	0–999,999	0	
Electric current time counter	0–999,999	0	

TABLE 1-continued

Status Information	Value Range	Initial Value	Privileges
Fuser counter (synchronous with total counter)	0–999,999	0	
Developer counter	0–999,999	0	
Drum electric potential control (counter correction)	0–1	1	
Pre-run starting time	0–15	6	
Pre-run operation time	0–24	2	
Fixing temperature during printing	0–24	18	
Change amount of fixing temperature during PRINTING –> READY	0–6	0	
Fixing temperature in the power save state	0–24	0	
Fixing temperature for thick sheets	0–4	0	
Setting of transfer and sheet separation correction conditions	0–3	0	
Black strip between papers	0–4	0	
Drum electric potential control (temperature correction)	0–1	1	
Laser power correction values	0–255	127	
APS Carriage start timing	0–15	0	
ADF switchback	0–1	0	
Cassette priority selection	0–6	0	
Image mode default	0–2	0	
Photo mode setting	0–1	0	
Intensity default for photo mode	0–1	0	
Intensity default for standard mode	0–1	0	
Intensity default for text mode	0–1	0	
Enlargement/reduction random interpolation	0–1	0	
Image mode default	0–1	0	
Photograph mode setting	0–1	0	
Intensity default for photograph mode	0–1	0	
Intensity default for standard mode	0–1	0	
Intensity default for text mode	0–1	0	
Smoothing (standard)	0–1	0	
Smoothing (text)	0–1	0	
ID code mode	0–1	0	R/W
Secondary scan magnification adjustment	0–1	0	
Automatic two-sided mode	0–2	0	R/W
APS priority selection	0–2	0	
SAPS mode	0–2	JPN:0 US:0 EUR:1	
ADF priority mode selection	0–1	0	
PM memory quantity secured	0–1	0	
Form registering	0–1	0	
Two-sided original document selection for books	0–1	0	R/W
[USER] key original document size selection	4–9 20–23 28–37	9 38 37	

TABLE 1-continued

Status Information	Value Range	Initial Value	Privileges
[USER] key paper size selection	4–7 20–23 28–37	9 38 37	
Manual feed auto start	0–1	0	
Date format	0–2	0	R/W
Sorter mode priority selection	0–3	0	R/W
Adjustment magnification during editing	0–10	10	
Input image position during continuous page copying	0–1	0	
Entry mode priority selection	0	0	

Preferably, the MFP **110***a* also utilizes a number of settings for its basic operating characteristics. Table 2 below sets forth a list of the preferred MFP **110***a* settings.

TABLE 2

Setting Information	Value Range	Initial Value	Privileges
Auto-toner automatic adjustment (heat roller lamp ON)	—	—	
Auto-toner sensor initial value adjustment	0–255	127	
Developing bias DC adjustment (Developing bias DC:ON)	0–255	128	
Grid voltage initial value adjustment (Main motor, discharger, charger, grid:ON)	0–255	128	
Transfer transformer DC output, high Center and low adjustments	0–255	160	
Separation AC output, high, center and low adjustments	0–255	128	
Cleaner pre-discharging AC output adjustment	0–255	128	
Laser automatic adjustment	0–255	—	
Laser sharpness, minimum, maximum and center values	0–255	127	
Scanner secondary scan magnification	0–255	127	
Scanner secondary scan displacement	0–255	127	
CCD primary scan displacement	0–255	128	
Halogen lamp lighting voltage setting	0–15	8	
White shading value display		—	
Original document edge image cut-Basic PPC	0–255	127	
Original document edge image cut-Expansion PPC	0–255	127	
Original document edge void gradation	0–255	128	
Secondary scan magnification, main and resist motors speed fine adjustment	0–255	127	
Laser firing position	0–255	127	
Margins-Basic and	0–255	127	

TABLE 2-continued

Setting Information	Value Range	Initial Value	Privileges
Expansion PPC			
Leading edge positions	0–255	127	
Aligning quantities	0–255	127	
Manual intensity fine adjustments	0–255	127	
Auto intensity fine adjustments	0–255	127	
User intensity center curve setting	[(–128)–((127)] x 17		
User intensity center curve selections	0–15	0	
Foundation cut quantity fine adjustments	0–255	255	
Black standard value offset quantities	0–255	255	
Range correction B/W standard values	0–255	0	
Foundation range width adjustments	0–15	0	
Gamma correction		—	
Coefficient setting for LPF and HPF	0–255 x 4	0 x4	
LPF and HPF settings for various enlargement/reduction modes	0–255	0	
Enlargement/reduction random interpolation	0–63	0	
During smoothing ON Halftone judgement threshold value	0–255	13	

FIG. **3** shows a general purpose computer **300** which is representative of the workstations **150** and file server **120**. The computer **300** preferably includes an Intel Corporation (San Jose, Calif.) processor **355** and runs a Microsoft Corporation (Redmond, Wash.) Windows operating system. In conjunction with the processor **355**, the computer **300** has a short term memory **350** (preferably RAM) and a long term memory **380** (preferably a hard disk) as known in the art. The computer **300** further includes a LAN interface **315**, a monitor **305**, a display adapter **320** and a bus **310**, as known in the art.

Turning now to FIG. **4**, the flow of data amongst the MFP **110***a*, the Host **110***b*, the file server **120** and the workstation **150** in accordance with the invention is shown. There are essentially two data flows: a first flow of status information from the multifunction peripheral **110***a* to the workstation **150**, and a second flow of setting information from the workstation to the multifunction peripheral.

The flow of status information from the multifunction peripheral **110***a* to the workstation **150** has essentially four parts. First, in loop **480**, the multifunction peripheral **110***a* determines its operating status. Second, in flow **410**, the multifunction peripheral **110***a* communicates status information to the Host **110***b*. Third, in flow **430**, the Host **110***a* communicates the status information to the file server **120**. Fourth, in flow **470**, the file server **120** communicates the status information to the workstation **150**.

The flow of setting information from the workstation **150** to the multifunction peripheral **110***a* has essentially three parts. First, in flow **460** the workstation **150** communicates setting information to the file server **120**. Second, in flow **430** the file server **120** communicates the setting information to the Host **110***b*. Third, in flow **420**, the Host **110***b* communicates the setting information to the multifunction peripheral **110***a*.

The file server **120** plays an important gate keeping role in these data flows. In accordance with the invention, four classes of users have been defined: network administrators, workgroup administrators, end users and technicians. The privileges of the user classes (network administrator, workgroup administrator, end user and technician) are preferably stored in the file server **110**. Each of these user classes is given access to different classes and quantities of intelligent peripheral device **110** status information and are permitted to change different classes and quantities of intelligent peripheral device **110** settings. Preferably, each class's privileges may be tailored to each intelligent peripheral device **110** in the network. If a user does not have an account on a given intelligent peripheral device **110** and he is not a network administrator, then his privileges are preferably automatically set to those of an end user.

Privileges may be either read/write, restricted read/write, or read only.

Network administrators have full read/write privileges of all settings and status information. The privileges of network administrators are preferably fixed and thus are not modifiable. Preferably, only network administrators may create user records with privileges of technician or network administrator.

A workgroup administrator is allowed to read and change settings relating to how a corresponding workgroup uses the intelligent peripheral device, including workgroup address books, letterhead features, watermarks, etc. Thus, a workgroup administrator may be given restricted read/write privileges overs these manageable date objects.

End users have fairly limited rights, primarily only the right to use the intelligent peripheral device in the manner defined by the workgroup administrator, and to determine the status of their own jobs submitted to the intelligent peripheral device.

Technicians have access to the intelligent peripheral device through the same type of workstation user interface provided to other users, and are allowed access to factory-level status information of the intelligent peripheral device, such as counters for periodic maintenance, temperature settings, automatic processing settings, etc., and technicians have control over factory-level settings.

An example of status information privileges and setting information privileges is shown in Tables 1 and 2, respectively. The last column of Table 1 reflects which user types are given privilege to view the respective status information. The last column of Table 2 reflects which user types are given privilege to change the respective setting information. Initially, the network administrator and work group administrator have the same privileges. However, the network administrator has rights to change the work group administrator privileges to copier attributes. Technicians have read access to all status information and setting information, and may change those indicated in Table 2.

In addition to the preset assignment of rights, network administrators are also given the limited privilege to add, remove and delete access of workgroup administrators and end users to certain settings and functions.

MFP Process

The MFP **110***a* preferably performs a programmed loop as shown in the flow chart of FIG. **5**. After the program is started (step **510**), the MFP **110***a* derives its status information (step **530**), and updates a table or database in the data storage device **245** with the status (step **540**). If the MFP **110***a* is to be shut down (step **550**), the process will of course terminate (step **595**). There may also be other reasons for stopping the process.

If the process is to continue, then in step **560** the MFP **110***a* checks if the Host **110***b* has requested the current status. If so, then the processor **235** reads the status from the data storage device **245** and transmits the status via the communications interface **215** to the Host **110***b* (step **565**).

In either case, the loop continues with the MFP **110***a* checking if the Host **110***b* has any setting changes (step **570**). If so, then the MFP **110***a* gets the setting changes from the Host **110***b* and makes the changes (step **575**). In either case, control continues at step **530**.

Host Process

The Host **110***b* preferably performs a programmed loop as shown in the flow chart of FIG. **6**. The Host **110***b* is responsible for initiating a refresh of a status information database in the long term data storage device **240**, and for communicating setting changes from the workstation **150** to the MFP **110***a*. The Host **110***b* preferably initiates a refresh of the status information on a periodic basis, but could also initiate refreshes on an event-driven basis, such as when the workstation **150** requests status information or requests a setting change.

After the program is started (step **610**), the Host **110***b* generates a signal to the MFP **110***a* to request that the MFP **110***a* transmit the status information to the Host **110***b* (step **620**). The Host **110***b* then receives the status information from the MFP **110***a* (step **630**), and the Host **110***b* stores the status information in the data storage device **240** (step **640**).

If the Host **110***b* is to be shut down (step **650**), the process will of course terminate (step **695**). There may also be other reasons for stopping the process.

Otherwise, the Host **110***b* determines whether the file server **120** has requested a refresh of the status information (step **660**). If so, the Host **110***b* reads the status information from the data storage device **240** and transmits the status information to the file server **120** (step **665**).

In either case, the loop continues with the Host **110***b* checking if the file server **120** has any setting changes (step **670**). This is preferably achieved by the Host **110***b* generating a signal to the file server **120** to request that the file server **120** transmit the setting information to the Host **110***b*. If the file server **120** has setting changes, then the Host **110***b* gets the setting changes from the file server **120** and stores the setting changes in the data storage device **240** (step **675**). In either case, control continues at step **620**.

File Server Process

After the program is started (step **710**), the file server **120** generates a signal to the Host **110***b* to request that the Host **110***b* transmit the status information to the file server **120** (step **720**). The file server **120** then receives the status information from the Host **110***b* (step **730**), and the file server **120** stores the status information in its data storage device (step **740**). Preferably the file server **120** stores and maintains the status information in the manner described in application Ser. No. 08/799,527 entitled "Method of Administering Work Group Printers" which is incorporated herein by reference.

If the file server **120** is to be shut down (step **750**), the process will of course terminate (step **795**). There may also be other reasons for stopping the process.

Otherwise, the file server **120** determines whether the workstation **150** has requested a refresh of the status information (step **760**). If so, the file server **120** reads the status information from its data storage device and transmits the status information to the workstation **150** (step **765**).

In either case, the loop continues with the file server **120** checking if the workstation **150** has any setting changes (step **770**). This is preferably achieved by the file server **120** generating a signal to the workstation **150** to request that the workstation **150** transmit the setting information to the file server **120**. If the workstation **150** has setting changes, then the file server **120** gets the setting changes from the workstation **150** and stores them in its data storage device (step **775**). In either case, control continues at step **720**.

Preferably, the file server **120** checks the user type at each status information request or setting information change. The file server **120** preferably only gets status information which a requesting workstation **150** has permission to get.

In peer-to-peer networks, a file server such as file server **120** may not be available. In such a situation, the Host **110***b* preferably performs the file server processes described herein. In such a case, communications of information from Host to file server are instead communications between processes within the Host **110***b*.

Workstation Process

The workstation **150**, rather than querying the intelligent peripheral device **110** for its status and sending setting changes directly to the intelligent peripheral device **110**, instead queries the file server **120** for the status information and passes setting changes to the file server for relay to the intelligent peripheral device **110**.

After the program is started (step **810**), the workstation **150** generates a signal to the file server **120** to request that the workstation **120** transmit the status information to the workstation **150** (step **820**). The workstation **150** then receives the status information from the file server **120** (step **830**), and the workstation **150** stores the status information in its data storage device (step **840**).

If the workstation **150** is to be shut down (step **850**), the process will of course terminate (step **895**). There may also be other reasons for stopping the process.

Otherwise, the workstation **150** requests a refresh of the status information (step **855**). After the file server **120** transmits the status information to the workstation **150**, the workstation stores the status information in its data storage device (step **860**). The workstation **150** then displays the status information on its display so that the user may appreciate the status of the intelligent peripheral device **110**.

The workstation **150** next provides a display on the display of current settings of the intelligent peripheral device **110**, and permits the user to indicate which settings the user wishes to change and the nature of the change (step **875**). Preferably, status information is refreshed at different rates to improve performance and reduce network congestion. After storing the setting changes (step **880**), the workstation **150** signals the file server **120** that the workstation **150** has setting changes to transmit and transmits the setting changes to the file server (step **885**).

Referring now to FIG. **9**, there is shown a screen shot of a status information and setting control program for an administrator in accordance with the invention. A window **900** includes standard Microsoft Windows controls and features which will be apparent to those of skill in the art. The window **900** includes three panes **910**, **920**, **930** relating the status information and setting control. The pane **910** provides a hierarchical list of available devices **913**. The devices **913** are organized by cluster **911** and workgroup **912**. For each device **913** there may be a number of objects **914** relating to the available settings and status for the device **913**. Those objects **914** may themselves relate to other objects **915**. The panes may be tiled as shown or layered as is known in the art.

For example, for a device **913***a* called TOnaga, there might be four objects **914**, called Current Jobs, Device Summary, Properties and Advanced Features. These objects

represent logical organizations of the status information and settings for the device **913***a*. The pane **920** displays details about a selected object **915***a* of the Advanced Features object **914***a*. Accordingly, the pane **920** lists the names of documents being printer, the owner of the jobs, the date and time the job was submitted and the status of the job. By selecting one of the jobs **921**, more details are made available in pane **930**. By selecting other objects similar presentations are made.

The Advanced Features object **914***a* provides an entry point in the display **900** for a network administrator to manage the privileges of other users.

Although exemplary embodiments of the present invention have been shown and described, it will be apparent to those having ordinary skill in the art that a number of changes, modifications, or alterations to the invention as described herein may be made, none of which depart from the spirit of the present invention. All such changes, modifications and alterations should therefore be seen as within the scope of the present invention.

It is claimed:

1. A method of allowing a user at a workstation to control settings of an intelligent peripheral device under control of a file server, the method comprising:

(a) the intelligent peripheral device determining operating conditions of plural predetermined aspects of the intelligent peripheral device;

(b) the intelligent peripheral device deriving status information regarding the operating conditions of the intelligent peripheral device;

(c) the intelligent peripheral device updating a first rewritable data storage device with the status information;

(d) the file server generating a first signal to the intelligent peripheral device to request that the intelligent peripheral device transmit the status information to the file server;

(e) the intelligent peripheral device reading the status information from a first data storage device;

(f) the intelligent peripheral device transmitting the status information to the file server;

(g) the file server receiving the status information from the intelligent peripheral device;

(h) the file server storing the status information in a second rewritable storage device;

(i) the workstation generating a second signal to the file server to request that the file server transmit the status information to the workstation;

(j) the file server reading the status information from the second data storage device;

(k) the file server transmitting the status information to the workstation;

(l) the workstation receiving the status information from the file server;

(m) the workstation storing the status information in a third rewritable data storage device;

(n) the workstation displaying on the display the status information from the third rewritable storage device;

(o) the workstation displaying on the display intelligent peripheral device settings available for change by the user;

(p) the workstation providing a user interface to the user through which the user inputs at least one intelligent peripheral device setting which the user desires to be changed a the setting information;

(q) the workstation storing the setting information in the third rewritable storage device;

(r) the workstation generating a third signal to the file server to request that the file server accept the setting information from the workstation;

(s) the file server generating a fourth signal to the workstation to request that the workstation transmit the setting information to the file server;

(t) the workstation reading the setting information from the third data storage device;

(u) the workstation transmitting the setting information to the file server;

(v) the file server receiving the setting information from the workstation;

(w) the file server storing the setting information in the second rewritable non-volatile data storage device;

(x) the file server generating a fifth signal to the intelligent peripheral device to request that the intelligent peripheral device accept the setting information from the file server;

(y) the intelligent peripheral device generating a sixth signal to the file server to request that the file server transmit the setting information to the intelligent peripheral device;

(z) the file server reading the status information from the third data storage device;

(aa) the file server transmitting the status information to the workstation;

(bb) the intelligent peripheral device receiving the setting information from the file server;

(cc) the intelligent peripheral device storing the setting information;

(dd) the intelligent peripheral device modifying its operation in accordance with the setting information.

2. The method of allowing a user at a workstation to control settings of an intelligent peripheral device under control of a file server of claim **1**, further comprising:

(a) the file server storing a permissions table of user types and permissions associated with each user type, the user types comprising technician, standard user and network administrator, the permissions comprising:

(i) for technicians, access to all status information and changes to all setting information;

(ii) for standard users, access to status information and changes to setting information;

(iii) for network administrators, access to all status information and changes to setting information;

(b) the workstation receiving from the user an input determinative of the user's user type;

(c) the workstation communicating the user type of the user to the file server.

3. The method of allowing a user at a workstation to control settings of an intelligent peripheral device under control of a file server of claim **2**, wherein the workstation communicates the user's user type to the file server prior to the file server transmitting the status information to the workstation, and the file server limiting the status information transmitted to the workstation in accordance with the user type.

4. The method of allowing a user at a workstation to control settings of an intelligent peripheral device under control of a file server of claim **2**, wherein the workstation communicates the user's user type to the file server prior to the file server transmitting the setting information to the intelligent peripheral device, and the file server limiting the

setting information transmitted to the intelligent peripheral device in accordance with the user type.

5. The method of allowing a user at a workstation to control settings of an intelligent peripheral device under control of a file server of claim 2, the user types further comprising workgroup administrators and the permissions for workgroup administrators comprising access to status information and changes to setting information.

6. The method of allowing a user at a workstation to control settings of an intelligent peripheral device under control of a file server of claim 1, wherein the step of the file server generating the first signal to the intelligent peripheral device to request that the intelligent peripheral device transmit the status information to the file server is performed periodically according to predetermined timing.

7. The method of allowing a user at a workstation to control settings of an intelligent peripheral device under control of a file server of claim 1, wherein the step of the file server generating the first signal to the intelligent peripheral device to request that the intelligent peripheral device transmit the status information to the file server is performed in response to the workstation, at a prior time, generating the second signal to the file server to request that the file server transmit the status information to the workstation.

8. The method of allowing a user at a workstation to control settings of an intelligent peripheral device under control of a file server of claim 1, wherein the first signal, the second signal, the third signal, the fourth signal, the fifth signal and the sixth signal comprise data signals carried on electronic communications media.

9. The method of allowing a user at a workstation to control settings of an intelligent peripheral device under control of a file server of claim 1, wherein the setting information includes any of the items in Table 2.

10. The method of allowing a user at a workstation to control settings of an intelligent peripheral device under control of a file server of claim 1, wherein the status information includes any of the items in Table 1.

11. The method of allowing a user at a workstation to control settings of an intelligent peripheral device under control of a file server of claim 1, the intelligent peripheral device comprising a multifunction peripheral comprising the first rewritable storage device, and a host comprising a fourth rewritable storage device, wherein

(a) steps (a) through (g) of claim 1 comprise:

the multifunction peripheral determining operating conditions of plural predetermined aspects of the multifunction peripheral;

the multifunction peripheral deriving the status information regarding the operating conditions of the multifunction peripheral;

the multifunction peripheral updating the first data storage device with the status information;

the host generating a seventh signal to the multifunction peripheral to request that the multifunction peripheral transmit the status information to the host;

the multifunction peripheral reading the status information from the first data storage device;

the multifunction peripheral transmitting the status information to the host;

the host receiving the status information from the multifunction peripheral;

the host storing the status information in the fourth data storage device;

the file server generating the first signal to the host to request that the host transmit the status information to the file server;

the host reading the status information from the fourth data storage device;

the host transmitting the status information to the file server;

(b) steps (x) through (dd) of claim 1 comprise:

the file server generating the fifth signal to the host to request that the host accept the setting information from the file server;

the host generating the sixth signal to the file server to request that the file server transmit the setting information to the host;

the host receiving the setting information from the file server;

the host storing the setting information in the fourth data storage device;

the Multifunction peripheral generating a seventh signal to the host to request that the host transmit the setting information to the multifunction peripheral;

the multifunction peripheral receiving the setting information from the host;

the multifunction peripheral modifying its operation in accordance with the setting information.

12. The method of allowing a user at a workstation to control settings of an intelligent peripheral device under control of a file server of claim 1,

the host generating a seventh signal to the multifunction peripheral to request that the multifunction peripheral accept the setting information from the host;

the multifunction peripheral generating an eighth signal to the host to request that the host transmit the setting information to the multifunction peripheral;

the host reading the setting information from the fourth data storage device,

the host transmitting the setting information to the multifunction peripheral;

the multifunction peripheral receiving the setting information from the host,

the multifunction peripheral storing the setting information in the multifunction peripheral,

the multifunction peripheral modifying its operation in accordance with the setting information.

13. The method of allowing a user at a workstation to control settings of an intelligent peripheral device under control of a file server of claim 1, wherein the step of the host generating the seventh signal to the multifunction peripheral to request that the multifunction peripheral transmit the status information to the host is performed periodically according to a predetermined timing rule.

14. The method of allowing a user at a workstation to control settings of an intelligent peripheral device under control of a file server of claim 1, wherein the step of the host generating the seventh signal to the multifunction peripheral to request that the multifunction peripheral transmit the status information to the host is performed in response to:

the workstation, at a prior time, generating the second signal to the file server to request that the file server transmit the status information to the workstation, and

the file server generating the first signal to the host to request that the host transmit the status information to the file server.

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